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CLINTON LABORATORIES

CENTRAL FILES NUMBER

46-2-277

B-137

Date 2/20/46

Subject The Dumping of Wastes of Unusual

Activity January 17 to January 25, 1946

By W. H. Ray

To K. Z. Morgan

File

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For: W. T. Gray, Supervisor
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Health Physics

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6. Aircraft
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**THE DUMPING OF WASTES OF UNUSUAL ACTIVITY
JANUARY 17 TO JANUARY 25, 1946**

Operation of the 206 (Tank Farm) area without sample reports from the Fission Product Laboratory led to the discharge of liquid wastes of abnormal activity over a period of five days to such an extent that even with careful manipulation of the White Oak Lake reservoir the discharge of water contaminated nearly to the tolerance level into the Clinch river was inevitable.

On January 24th report sheets covering the preceding five day period were received in a group from the 206 Fission Product Laboratory. These report sheets show the results of the samples taken from the settling basin inlet and outlet every four hours. With the exception of the second day all the effluent activities reported were greater than the 400 counts per minute per ml accepted as the maximum activity concentration to be permitted to be discharged into White Oak Creek. Some of the samples reported were fifteen times this value. This delay of reports has been attributed to a backlog of work piling up in the 206 laboratory from two causes.

- (1). Only one counter was in operating condition during most of this period.
- (2). Maximum counting efficiency was not possible with the new and inexperienced counter operators that were on the job.

The activity of the water as indicated by the recording G. M. counter located at White Oak dam started to rise rapidly January 23rd and by January 24th it was counting 3700 counts per minute, at least four times the usual rate.

This information reached the Health Physics office within an hour of the arrival of the laboratory reports. Fortunately the water in the reservoir was at a low level from operating with the lower gate closed and the upper one completely open. The rain fall for the preceding period had been light. At 4:00 PM on January 24th the upper gate was closed in order to raise the level of the lake six feet (the maximum possible) which would provide a dilution factor of 5 from the increased pondage.

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S. Braylee for R.T. Gray, Jr., Records Dept., OPRC

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This volume dilution, must be considered to be off-set by the drainage of active material held up in the two miles of creek valley even though the source of contamination was to be shut off immediately.

It was learned that jetting from W-6 to the settling basin had proceeded continuously for the seven days prior to January 24th. This seemed to be the obvious source of activity and the jetting was stopped on the evening of January 24th. However, cooling water from the 105 canal continued to flow into the settling basin, partially rinsing activity from it until January 25th when the cooling water was largely diverted to the old cooling ponds which were empty. The cooling ponds capacity is limited to about thirty-six hours flow of cooling water, but the over flow by-passed the settling basin to the creek which is what was wanted. Complete diversion of the cooling water by this route could not be achieved because the shut-off arrangement in the diversion box permitted about 1/3 of the flow to continue through the settling basin.

That something was amiss was determined on January 17th when the routine electroscope readings taken from the exit side outwalk across the settling basin jumped from the current value of 2 mr/hr to 13 mr/hr. In an effort to do something the 206 operators cut the cooling water flow to a minimum in order to increase the travel time across the settling basin. However, the W-6 jet was not shut off until requested by Health Physics on January 24th. The limited experience of the operators had not witnessed any extreme fluctuation in the settling basin effluent and so they were in some measure unaware of the consequences which might develop from operating without up-to-date sample information to determine control procedures. That the protection of the drinking water systems of the Tennessee and Mississippi river valleys depend upon the correct handling of our liquid wastes cannot be over emphasized for those responsible for their control. The taking of chances is unwarranted!

The rate of water rise in White Oak Lake indicated by January 28th that a hold up for one week was the best that could be hoped for even with the freezing weather which prevailed. This hold up time was cut short when more than 1-1/2 inches of rain fell the morning of January 30th. The water started to spill over the steel piling of the dam about 11:00 AM on January 30th.

The dilution had reduced the activity during the hold up only about 1/3 from the maximum observed January 24th. The activity at a point immersed in the water at White Oak Lake did not exceed 1/2 mr/hr as determined by the two container count-

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ing method used to measure water routinely. However, it has been determined that the radiation tolerance of 4 mr/hr in water is only significant as long as Strontium contributes less than 1% to the total activity.

A sample of water taken from the lake at 9:00 AM on January 30th was analyzed for Strontium and 40 counts per minute per ml with a geometry of 10% was reported. Previous experience analyzing weak samples has indicated that the sum of the separated element counts often equals about twice the gross count, but even if we make this allowance

$$\frac{20 \times 10}{2.22 \times 10^6} = 10^{-4} \text{ \mu curies/ml of Strontium}$$

Assuming that all the activity were from long life Strontium, a tolerance concentration in drinking water might be considered to be 7×10^{-5} \mu curies/ml. From these figures it would appear that some water left White Oak Lake contaminated slightly above tolerance with Strontium.

It is fortunate this was a temporary condition and that the concentration fell as additional rain brought further dilution. Also considerable dilution occurs as soon as the White Oak Lake effluent reaches the Clinch river.

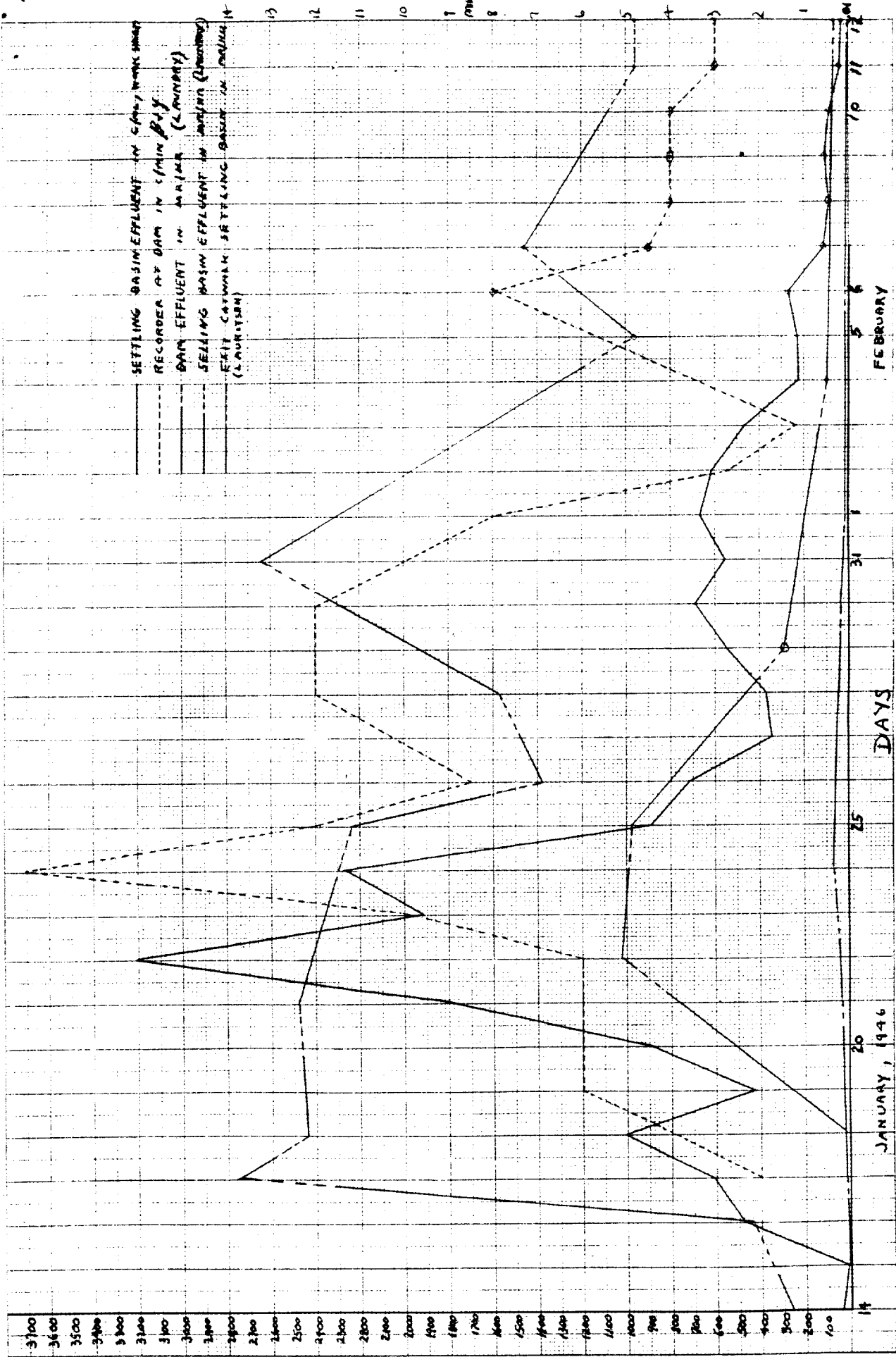
This was checked by obtaining samples from three different down stream locations along the Clinch river on the following day. No positive gross counts were observed from the samples with a counting probable error of ± 2 counts per min per ml. That this event was experienced without serious consequences should not lull us into complacency but should spur us to maintain increased vigilance toward preventing any such accident, the magnitude of which might easily have been greater.

The return of White Oak Lake activity to normal values after purging by three inches of rain fall warranted opening of the upper gate of the dam on February 4th. However, the draining of activity held up in the creek bed increased the contamination of White Oak Lake so that on February 8th it again became advisable to close the upper gate. A 1.65 in. rain fall on February 9th and 10th again caused the dam to overflow and resulted in the return of activity to the usual levels so that the upper gate could be opened for normal operation.

The accompanying chart indicates the activity at the settling basin outlet and the dam as determined by different methods, for the period following January 14, 1946. A word of caution: This is a broken line chart and is only valid at the points of flexure.

W. H. Ray

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